Astronomical Tables of the Sun, Moon, and Planets

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1983

EPHEMERIS TIME AND UNIVERSAL TIME

The Ephemeris Time (ET) is a uniform time based on the planetary motions. The Universal Time (UT), necessary for civil life, is based on the rotation of the Earth. Universal Time is the same as Greenwich Civil Time.

Because the Earth's rotation is slowing down — and, moreover, with unpredictable irregularities — UT is not a uniform time. Since the astronomers need a uniform time scale for their calculation of accurate ephemerides, they use ET in that case.

The exact value of the difference ΔT = ET - UT at a given epoch can be deduced only from observations. Table A on the next page gives the value of ΔT, in seconds of time, for the *beginning* of some years. The values for 1680 to 1898, due to Spencer Jones, have been taken from André Danjon's *Astronomie Générale* (Paris, 1959), page 121.

For the year 1982, the value ΔT = +53 seconds can be used. For the next years, increase ΔT by +1 second per year, in order to obtain an extrapolated provisional value of ΔT.

For epochs outside the time interval 1680 - 2000, an *approximate* value of ΔT, in *minutes*, can be calculated from

$$\Delta T = +0.41 + 1.2053\,T + 0.4992\,T^2$$

where T is the time in centuries since the year 1900. This leads to Table B. It should be noted

that for the very past and future, the tabulated values of ΔT may be in error by several minutes, as the fluctuations due to the variable rotation of the Earth are unknown for these epochs.

Tabulated times in ET may be converted into Universal Time by *subtracting* from them the quantity ΔT, since we have $UT = ET - \Delta T$. In Part 1 of this book, all times have already been converted from ET to UT.

Example 1. — On page 4-10 we find the following times for lunar phases :

Last Quarter	1980 May 7	$20^h51^m26^s$ ET
New Moon	May 14	12 01 01
First Quarter	May 21	19 16 47

In 1980, ΔT was equal to +51 seconds. Consequently, the phases above took place at the following UT instants :

1980 May 7	$20^h50^m35^s$ UT
May 14	12 00 10
May 21	19 15 56